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# Non-Markov stochastic dynamics of real epidemic process of respiratory infections

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**Abstract**

The study of social networks and especially of stochastic dynamics of diseases spread in human population has recently attracted considerable attention in statistical physics. In this work we present a new statistical method of analyzing the spread of epidemic processes of grippe and acute respiratory track infections (ARTI) by means of the theory of discrete non-Markov stochastic processes. We use the results of our last theory (Phys. Rev. E 65 (2002) 046107) to study statistical memory effects, long-range correlation and discreteness in real data series, describing the epidemic dynamics of human ARTI infections and grippe. We have carried out the comparative analysis of the data of the two infections (grippe and ARTI) in one of the industrial districts of Kazan, one of the largest cities of Russia. The experimental data are analyzed by the power spectra of the initial time correlation function and the memory functions of junior orders, the phase portraits of the four first dynamic variables, the three first points of the statistical non-Markov parameter and the locally averaged kinetic and relaxation parameters. The received results give an opportunity to provide a strict quantitative description of regular and stochastic components in epidemic dynamics of social networks taking into account their time discreteness and effects of statistical memory. They also allow to reveal the degree of randomness and predictability of the real epidemic process in the specific social network.


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